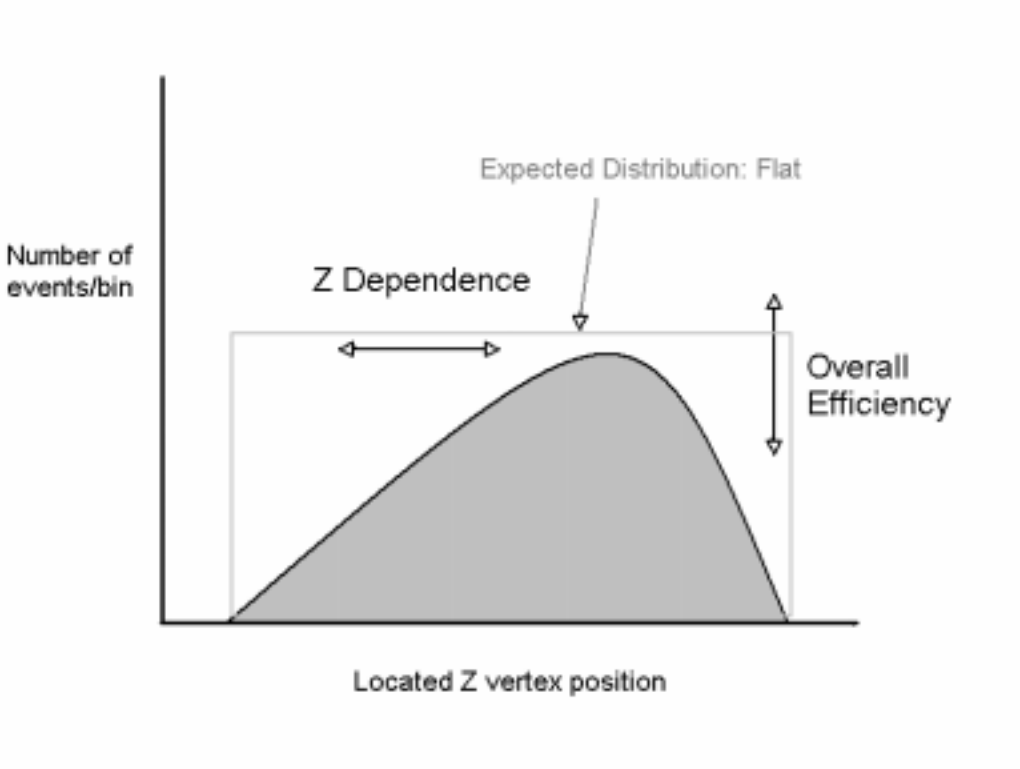
Event Location Efficiency Study-II

This time I'll be looking at the Z ***independent*** overall efficiency…



→ **<u>From last week:</u>** The Z dependence of the location efficiency can be factorized into two parts:

1) Spectrometer prediction efficiency(shape)
2) Emulsion Scan efficiency

The Z dependent efficiency –
70±8% (correcting for spectrometer predictions -75±8%)

• *I'm assuming that the Z independent inefficiency is due solely to the event multiplicity cut required for (net)scanning.*
• First I looked at the data (175 events)…..

1) Figure 1 contains plots of located event 1^{ry} charged multiplicities. Top plot – no cuts, middle plot - no 1 segment tracks, bottom plot – number of 1 segment tracks per event

2) Figure 2 contains plots of projected emulsion track angles (U,V) for located events. Top plots – no cuts, middle plots - no 1 segment tracks, bottom plots – only 1 segment tracks

3) Figure 3 contains plots of total emulsion track angles. Top plots – no cuts, middle plots - no 1 segment tracks, bottom plots – only 1 segment tracks

4) Figure 4 again contains plots of located event 1^{ry} charged multiplicities but with a 200mr total angle cut (top plot), 200mr total angle cut + ***no*** 1 segment emulsion tracks(bottom plot). Why I generated these distributions will become clear….

• Now I tried to compare to the MC distribution…
→ I generated 10,000 events with the following parameters:

ratio of $\nu_e / \nu_\mu / \nu_\tau$ **:** 0.43/0.52/0.05
ratio of cc/nc interactions: 0.75/0.25
ratio of neutrino/anti-neutrinos: 0.5/0.5
fraction of nonprompt ν**'s:** 0.20

(Note: I need to study the systematic effects of changing these parameters)

- I really don't know how to deal with one segment emulsion tracks. Therefore I cut on the total angle of the primary tracks, requiring them to be less than 200mr. From figure 3 the "contamination" in the data from one segment tracks reduces to ~10%.

→ Figures 5 and 6 compare the MC charged primary multiplicity (*e's*, μ's, τ's, π's, *k*'s, and protons only) result (with angle cut) to the multiplicity distributions generated in figure 4 (same angle cut).
(Note on MC normalization: The MC distribution was normalized to the data by counting the number of events with greater than 3 charged primary tracks.

→ From the difference in number of events between MC and data in figures 5 and 6, the efficiency resulting from the multiplicity cuts is: 77±7% (only 200mr angle cut on the data) ***or*** 86±7% (200mr cut and no one segment emulsion tracks). ← I will include this difference as a systematic

- Including the Z dependent efficiency result from last week(70±8%), the total event location efficiency I obtain is:

54%±11%(stat.)+6%(sys.)